

Plunger Pumps

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference.

Description

Plunger Pumps are designed for a wide variety of high pressure washing applications. They are constructed of die-cast bodies and feature a forged brass head. Internal components include special thick solid ceramic plungers for long life and durability. Precision cast cooling fins are anodized for maximum heat dissipation. Oversized tapered roller bearings and the precision supports assure proper shaft alignment and maximum life. Valve cages of special designed Ultra-Form provide positive seating and extended life. One-piece connecting rods are either a special alloy aluminum or bronze oversized for strength and load disbursement. These pumps are designed for gearbox , belt drive, or coupling drive systems, electric motor 182-184 frame driven systems, or gasoline engine driven systems.

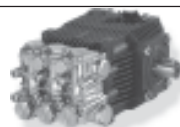


Figure 1 - RKHN

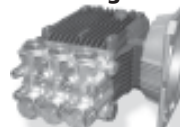


Figure 2 - RK-F17



Figure 3 - RK-F24

RK 1450 rpm N Version

Model	Max GPM	Max PSI
RK11.14N	2.9	2000
RK11.20HN	2.9	2900
RK13.12N	3.43	1740
RK13.20HN	3.43	2900
RK14.16N	3.7	2300
RK15.15N	3.96	2200
RK15.20HN	3.96	2900
RK15.28HN	3.96	4000
RK18.20HN	4.75	2900
RK18.28H	4.75	4000
RK21.20HN	5.55	2900

RKA 1750 rpm N Version

Model	Max GPM	Max PSI
RKA3.5G25N	3.5	2500
RKA3.5G30N	3.5	3000
RKA3.5G40HN	3.5	4000
RKA4G20N	4.0	2000
RKA4G30N	4.0	3000
RKA4G30HN	4.0	3000
RKA4G35N	4.0	3500
RKA4G40HN	4.0	4000
RKA4.5G17N	4.5	1700
RKA4.5G25HN	4.5	2500
RKA4.5G35HN	4.5	3500
RKA5.5G13N	5.5	1300
RKA5.5G20HN	5.5	2000
RKA5.5G30HN	5.5	3000

Model	Max GPM	Max PSI
RKA6.5G20HN	6.6	2000
RKA7G20HN	7.1	2000

RKA 1750 rpm E Version 1-1/8"

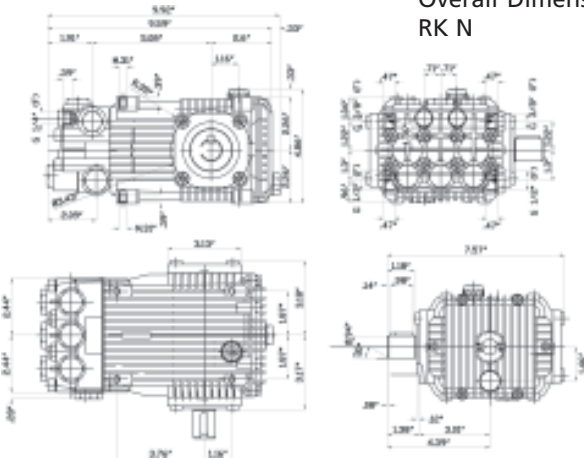
Model	Max GPM	Max PSI
RKA3.5G30E-F17	3.5	3000
RKA3.5G30HE-F17	3.5	3000
RKA3.5G40HE-F17	3.5	4000
RKA4G20E-F17	4.0	2000
RKA4G30E-F17	4.0	3000
RKA4G30HE-F17	4.0	3000
RKA5.5G13E-F17	5.5	1300
RKA6.5G20HE-F17	6.6	2000
RKA7G20HE-F17	7.1	2000

RKV 3400 rpm D Version - 1"

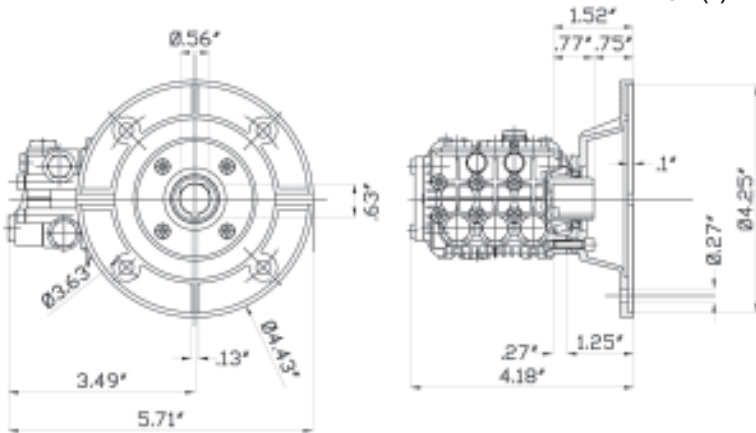
Model	Max GPM	Max PSI
RKV3.5G30AD-F24	3.5	3000
RKV3.5G35D-F24	3.5	3500
RKV3.5G40HD-F24	3.5	4000
RKV4G30AD-F24	4.0	3000
RKV4G32D-F24	4.0	3200
RKV4G35HD-F24	4.0	3500
RKV4G40HD-F24	4.0	4000
RKV4.5G22D-F24	4.5	2200
RKV4.5G40HD-F24	4.5	4000
RKV5G40HD-F24	5.0	4000
RKV5.5G40HD-F24	5.5	4000

Plunger Pumps

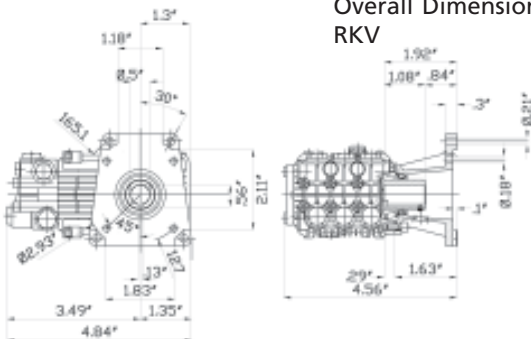
Overall Dimension in inches:
RK N 9.9(L) x 7.6(W) x 4.9(H)



Overall Dimension in inches:
RKA - F17 9.7(L) x 9.1(W) x 5.8(H)



Overall Dimension in inches:
RKV 9.7(L) x 9.1(W) x 5.8(H)



SPRAY NOZZLE CHART

Nozzle #	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200	3400	3600	3700	4000	4200	4400	4600	4800	5000
	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI	PSI
2.0	1.00	1.10	1.18	1.26	1.34	1.41	1.48	1.55	1.61	1.67	1.73	1.79	1.84	1.90	1.92	2.00	2.05	2.10	2.14	2.19	2.40
2.25	1.13	1.23	1.33	1.42	1.51	1.59	1.67	1.74	1.81	1.88	1.95	2.01	2.07	2.13	2.16	2.25	2.31	2.36	2.41	2.46	2.52
2.5	1.25	1.37	1.48	1.58	1.68	1.77	1.85	1.94	2.02	2.09	2.17	2.24	2.30	2.37	2.40	2.50	2.56	2.62	2.68	2.74	2.80
2.75	1.38	1.51	1.63	1.74	1.84	1.94	2.04	2.13	2.22	2.30	2.38	2.46	2.54	2.61	2.64	2.75	2.82	2.88	2.95	3.01	3.07
3.0	1.50	1.64	1.77	1.90	2.01	2.12	2.22	2.32	2.42	2.51	2.60	2.68	2.77	2.85	2.89	3.00	3.07	3.15	3.22	3.29	3.35
3.25	1.63	1.78	1.92	2.06	2.18	2.30	2.41	2.52	2.62	2.72	2.81	2.91	3.00	3.08	3.13	3.25	3.33	3.41	3.49	3.56	3.63
3.5	1.75	1.92	2.07	2.21	2.35	2.47	2.60	2.71	2.82	2.93	3.03	3.13	3.23	3.32	3.37	3.50	3.59	3.67	3.75	3.83	3.91
4.0	2.00	2.19	2.37	2.53	2.68	2.83	2.97	3.10	3.22	3.35	3.46	3.58	3.69	3.79	3.85	4.00	4.10	4.20	4.29	4.38	4.47
4.5	2.25	2.46	2.66	2.85	3.02	3.18	3.34	3.49	3.63	3.76	3.90	4.02	4.15	4.27	4.33	4.50	4.61	4.72	4.83	4.93	5.03
5.0	2.50	2.74	2.96	3.16	3.35	3.54	3.71	3.87	4.03	4.18	4.33	4.47	4.61	4.74	4.81	5.00	5.12	5.24	5.36	5.48	5.59
5.5	2.75	3.01	3.25	3.48	3.69	3.89	4.08	4.26	4.43	4.60	4.76	4.92	5.07	5.22	5.29	5.50	5.64	5.77	5.90	6.02	6.15
6.0	3.00	3.29	3.55	3.79	4.02	4.24	4.45	4.65	4.84	5.02	5.20	5.37	5.53	5.69	5.77	6.00	6.15	6.29	6.43	6.57	6.71
6.5	3.25	3.56	3.85	4.11	4.36	4.60	4.82	5.03	5.24	5.44	5.63	5.81	5.99	6.17	6.25	6.50	6.66	6.82	6.97	7.12	7.27
7.0	3.50	3.83	4.14	4.43	4.70	4.95	5.19	5.42	5.64	5.86	6.06	6.26	6.45	6.64	6.73	7.00	7.17	7.34	7.51	7.67	7.83
7.5	3.75	4.11	4.44	4.74	5.03	5.30	5.56	5.81	6.05	6.27	6.50	6.71	6.91	7.12	7.21	7.50	7.69	7.87	8.04	8.22	8.39
8.0	4.00	4.38	4.73	5.06	5.37	5.66	5.93	6.20	6.45	6.69	6.93	7.16	7.38	7.59	7.69	8.00	8.20	8.39	8.58	8.76	8.94
8.5	4.25	4.66	5.03	5.38	5.70	6.01	6.30	6.58	6.85	7.11	7.36	7.60	7.84	8.06	8.18	8.50	8.71	8.91	9.12	9.31	9.50
9.0	4.50	4.93	5.32	5.69	6.04	6.36	6.67	6.97	7.26	7.53	7.79	8.05	8.30	8.54	8.66	9.00	9.22	9.44	9.65	9.86	10.06
9.5	4.75	5.20	5.62	6.01	6.37	6.72	7.05	7.36	7.66	7.95	8.23	8.50	8.76	9.01	9.14	9.50	9.73	9.96	10.19	10.41	10.62
10.0	5.00	5.48	5.92	6.32	6.71	7.07	7.42	7.75	8.06	8.37	8.66	8.94	9.22	9.49	9.62	10.00	10.25	10.49	10.72	10.95	11.18
11.0	5.50	6.02	6.51	6.96	7.38	7.78	8.16	8.52	8.87	9.20	9.53	9.84	10.14	10.44	10.58	11.00	11.27	11.54	11.80	12.05	12.30
12.0	6.00	6.57	7.10	7.59	8.05	8.49	8.90	9.30	9.67	10.04	10.39	10.73	11.06	11.38	11.54	12.00	12.30	12.59	12.87	13.15	13.42
12.5	6.25	6.85	7.40	7.91	8.39	8.84	9.27	9.68	10.08	10.46	10.83	11.18	11.52	11.86	12.02	12.50	12.81	13.11	13.40	13.69	13.98
13.0	6.50	7.12	7.69	8.22	8.72	9.19	9.64	10.07	10.48	10.88	11.26	11.63	11.99	12.33	12.50	13.00	13.32	13.63	13.94	14.24	14.53

Gallons Per Minute

Plunger Pumps

Formulas

Nozzles:

Impact Force (lbs.) = .0526 x GPM x $\sqrt{\text{PSI}}$

Nozzle # = GPM x $\frac{4000}{\sqrt{\text{PSI}}}$

GPM = Nozzle # x $\frac{\text{PSI}}{\sqrt{4000}}$

PSI = (GPM/Nozzle #)² x 4000

Horse Power:

$\frac{\text{GPM} \times \text{PSI}}{1714}$ = Hydraulic HP

$\frac{\text{GPM} \times \text{PSI}}{1457}$ = EBHP

$\frac{\text{EBHP} \times 1457}{\text{PSI}}$ = GPM

$\frac{\text{EBHP} \times 1457}{\text{GPM}}$ = PSI

HP loss due to altitude = 3% per 1000 FT above sea level

Pump Speed and Flow:

$\frac{\text{Rated GPM}}{\text{Rated RPM}} = \frac{\text{Desired GPM}}{\text{Desired RPM}}$

Rated RPM Desired RPM

$\frac{\text{Motor Pulley } \varnothing}{\text{Pump RPM}} = \frac{\text{Pump Pulley } \varnothing}{\text{Motor RPM}}$

Conversions

Gallons x 3.785412 = Liters

Gallons x 128 = Oz.

PSI x .06896 = Bar

Bar x 14.5038 = PSI

1 inches = 25.4 millimeters

Liters x .2642 = Gallons (US)

Ft. Lbs. x 1.356 = Newton Meters

Inch Lbs. x .11298 = Newton Meters

Newton Meters x .737562 = Ft. Lbs. (force)

Newton Meters x 8.85 = In. Lbs. (force)

Temperature = 1.8(C° + 17.78) = F°, .555(F° - 32) = C°

1 U.S. Gallon of freshwater = 8.33 lbs.

1 PSI = 2.31 feet of water

1 PSI = 2.04 inches of mercury

1 Foot of water = .433 PSI

1 Foot of water = .885 inches of mercury

1 Meter of water = 3.28 feet of water

Kilograms x 2.2 = Lbs.

General Safety Information

WARNINGS

Gasoline Drive Pumps

 The pump is designed to pump non-flammable or non-explosive fluids. These pumps are intended to pump clean filtered water only.

 Do not operate in or around an explosive environment.

 Always wear safety glasses or goggles and appropriate clothing.

 Do not alter the pump from the manufacturers design.

 Do not allow children to operate the pump.

 Never point the high-pressure discharge at a person, any part of the body or animals.

Do not operate gasoline engines in a confined area; always have adequate ventilation.

 Do not exceed the pump specifications in speed or pressure.

Plunger Pumps

General Safety Information (continued)



Maximum water temperature is 140°F.

All positive displacement plunger pumps must have a safety relief valve installed on the discharge side of the pump, this valve could be either an unloader or regulator and must be of adequate flow and pressure for the pump.

Adequate protective guards must cover all moving parts. Perform routine maintenance on the pump and components.

Use only components that are rated for the flow and pressure of the pump, this would include hose, fittings, safety valves, spray guns etc.

Electric Drive Pumps

Your power supply must conform to the system requirements.



The motor must be grounded. Use GFCI plugs and receivers.



Do not handle the pump/motor with wet hands.



Only use power cords that are in good condition.



Never pull the unit by the power cord.

Never spray or clean the unit with water

Failure to follow these warnings may result in personal injury or damage to property.

Special Features

Wet End

Manifold: Forged Brass: Strength and no porosity – long life. higher hydrostatic pressures – safety, performance.

Inlet and Discharge Ports: Heavy bosses for added strength. **Offset Discharge Ports:** High efficiency, smooth flow. **Bolts:** Eight bolts, 8mm, grade 8.8.

Valves: Valve Caps: Stainless steel on pumps rated at 3200 PSI and higher, better hydrostatic loads. Machined brass on pumps <3200 PSI. **Ultra Form Cages:** Durable, strength, and long life. **Poppets, Seat and Spring:** 303 and 400 series stainless steel.

Packing and Plungers: High Pressure Packing: "V" style (D-1) Buna-N (cotton duct weave base) strong and tightens under load. **Low Pressure Seals:** "U" cup double lip Buna-N for a good positive seat. **Support and Guides:** Machined brass, 1-piece construction to assure proper plunger alignment and to maximize packing and seal life. **Plungers:** Are a special aluminum oxide blend, solid ceramic for long life, strong durability and more resilient.

Drive End

Bearings: Oversized tapered roller bearing for maximum life and load disbursement.

Bearing Support: Precision die-cast and machined to assure concentricity and alignment.

Plunger Pumps

Special Features (continued)

Crankcase: Precision die-cast, large cooling fins and anodized (for maximum heat dissipation).

Rear Cover: Precision die-cast, O-ring sealed and bayonet style sight glass for positive sealing and locking (no threads to loosen).

Plunger Rods: Stainless steel construction for strength (no plating to scrape off), back-up and O-ring plunger sealing system.

Rod Pins: Precision ground and hardened steel, oversized for load disbursement.

Connecting Rods: One-piece special allow aluminum (3XU51, 3XU60 and 3XU68) or bronze (3XU52, 3XU54, 3XU61 and 3XU62) for higher pressure, oversized for maximum strength, load disbursement, and life. Heavy pin area construction, for added load strength.

Crankshaft: Forged, precision ground and hardened for extremely long life and durability.

Oil Seals and O-rings: Triple lip oil seals, long life and much less leak prone. All are constructed of Buna-N rubber. The O-rings have stainless steel garder springs to assure constant tension on the sealing surface.

Oil Drains: Quantity of two (2). One in the rear cover and one in the bottom of the crankcase.

Oil Capacity: 15.5 oz.

Extra Features

Dyno Proven: All pumps are dyno tested to assure the theoretical design meets the actual design.

Valve Design: Each pump series has a valve design that optimizes its highest efficiency.

Installation

Direct Drive Electric and Gasoline Pumps

1. Install the shaft key into the keyway and apply a light coating of anti-seize on the engine shaft.
2. Align the two key ways and push the pump completely onto the engine. (See Figure 4 & 5)
3. Install all four (4) bolts and tighten evenly.
4. Remove the red shipping oil cap and install the black crankcase vent cap. (See Figure 6)
5. Install the appropriate unloader valve and other accessories.
6. Install the appropriate water inlet and discharge fittings.
7. Connect the water supply hose and high-pressure discharge hose/spray gun.
8. Turn on the water supply.



Figure 4

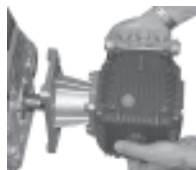


Figure 5

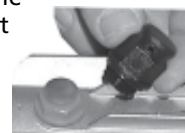


Figure 6

Plunger Pumps

Installation (continued)

9. Open the spray gun to purge the system of any air.
10. Start the engine.
11. Adjust the engine speed and unloader valve.

Belt Drive Systems

1. Mount the pump securely to the base plate. (See Figure 7) For new installation a mounting rail kit is required, refer to parts breakdown.



Figure 7

2. Install the pump pulley on the crankshaft. It should be as far onto the shaft as possible.
3. Align the pulleys so they are in line. (See Figure 8)



Figure 8

4. Use a belt tension gauge to assure proper tension (too much tension can cause bearing failure or damage the belts as well as cause other problems). (See Figure 9)



Figure 9

5. Installation complete.

Winter or Long Time Storage

1. Drain all of the water out of the pump.
2. Run a 50% solution of a RV or non-toxic/biodegradable antifreeze through the pump.

3. Flush the pump with fresh water before the next use.
4. In freezing conditions failure to do this may cause internal pump damage.
5. For long periods of storage in non-freezing areas the solution will keep the seals and O-rings lubricated.

Service Pumps

Servicing the Valves

The inlet and discharge valves in this series pumps are all the same. The valves are located under the six 24mm hex plugs. The inlet valves are located on the lower row and the discharge valves are located on the top row of the pump head.

Tools required: 24mm socket, ratchet, needle nose pliers, mechanics pick and torque wrench.

Valve Removal:

1. Remove the valve cap.
2. Inspect the valve cap O-ring for any damage, replace if necessary. (See Figure 10)
3. Use the needle nose pliers to remove the valve. (See Figure 11)



Figure 10



Figure 11

Plunger Pumps

Service Pumps (continued)

4. Use a small probe to move the poppet up and down to assure that the valve is functioning properly and that no debris is stuck in the valve. (See Figure 12)



Figure 12

5. Using the mechanics pick remove the valve seat O-ring and inspect for any damage, replace if necessary. (See Figure 13)



Figure 13

Valve Assembly:

1. Install the valve seat O-ring squarely into the bottom of the manifold. (See Figure 14)
2. Insert the valve assembly squarely into the port pushing it into the O-ring. (See Figure 15)
3. Install the valve cap and torque to the proper specification. (See Figure 16) (See parts breakdown)



Figure 14



Figure 15



Figure 16

Servicing the Packings/Seals

To access the water seals for inspection or

replacement, you will first need to remove the head of the pump.

Tools required: 6mm hex socket, ratchet, (2) long screwdrivers, reversible pliers, mechanics pick and torque wrench.

Disassembly:

1. First remove the eight 6mm head bolts. (See Figure 17)
2. Place the screwdrivers as shown between the head and crankcase of the pump, lifting one up and the other down. The head should start to lift off of the plungers. (See Figure 18)



Figure 17



Figure 18

3. When you remove the head you may notice that some of the water seals have stayed on the plungers and some in the head. (See Figure 19) To remove the seals from the plungers simply turn the assemblies and pull off.



Figure 19

4. If the seal assemblies are in the head use the reversible pliers to grab the seal retainer on the inside bore



Figure 20

(NOTE: Use a rag so you do not mar the piston guide area), twist the retainer in either direction

Plunger Pumps

Service Pumps (continued)

(NOTE: This is done to free the retainer O-ring which is stuck to the manifold) and lift out. (See Figure 20 & 21)

5. With your fingers pull the high pressure seal and head ring out of the head. (See Figure 22)



Figure 21

6. The low-pressure seal is located in the brass seal retainer. Using the mechanics pick go in between the seal and retainer, twist and pull, the seal will come out of the gland. (See Figure 23 & 24)



Figure 22

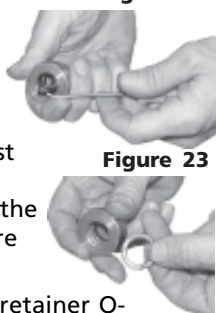


Figure 23

7. Remove the seal retainer O-ring with the mechanics pick. (See Figure 25)

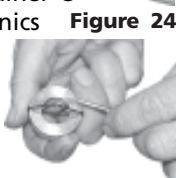


Figure 24

Assembly:

1. Install the plastic head ring into the head (*the flat side is on the bottom*). (See Figure 26)

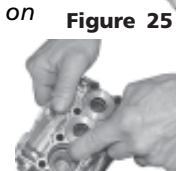


Figure 25

2. Install the high-pressure seal. Place the seal so the open "V" portion is toward the head ring. You need



Figure 26

to place the seal at an angle and pull and push to work the seal into position with your fingers (*do not use and tools you may damage the seal*). Make sure the seal is totally seated against the head ring. (See Figure 27 & 28)

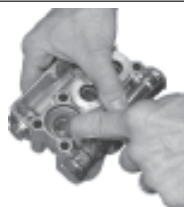


Figure 27

3. Installing the low-pressure seal. You want the open side of the seal to be pointed toward the water side of the head (toward the high-pressure seal) and the flat side toward the drive end of the pump.

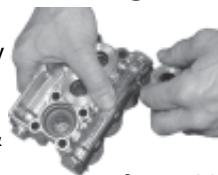


Figure 28

Place the seal into the gland at an angle, with your finger push the exposed side of the seal towards the center and work the seal (See Figure 29, 30 & 31) into position. After the seal is in the gland you can work it into its proper position.



Figure 29



Figure 30



Figure 31

4. Install the retainer O-ring. (See Figure 32)



Figure 32

Plunger Pumps

Service Pumps (continued)

5. Squarely seat the retainer into the head and push with even pressure until it snaps into position. (See **Figure 33**)



Servicing the Plungers

If the plungers are not damaged they do not need any servicing.

Tools required: 16mm socket, ratchet, mechanics pick, taper blade gasket scraper, thread sealant and torque wrench.

NOTE: Be very careful when working with the plungers, they are made from ceramic which is brittle and can be damaged.

Any time you remove a plunger it is recommended you replace the slinger washer, O-ring and top plunger washer. The washers are a cushion for the ceramic plunger and compress when first used and the O-ring will take a set to create a seal and usually will not spring back to its original shape. By not replacing these parts you run the risk of breaking a plunger or having a water leak.

Disassembly:

1. Remove the plunger retainer nut. (See **Figure 34**)
2. Insert the gasket scraper between the copper washer and plunger to remove the washer. (See **Figure 35**)



Figure 35

3. Twist and pull the plunger off the plunger rod.
4. Remove the plunger rod O-ring seal and split back-up ring with the mechanics pick. (See **Figure 36 & 37**)
5. Remove brass slinger. At this point clean any thread locker that is left on the plunger rod and retaining nut threads. (See **Figure 38**)



Figure 36



Figure 37



Figure 38

Assembly:

1. Install the slinger washer. (See **Figure 39**)
2. Install the plunger rod O-ring and split back-up ring. Place a light film of oil on the O-ring and back-up ring. (See **Figure 40**)



Figure 39



Figure 40

NOTE: The O-ring is closest to the threaded end of the rod.

3. Install the plunger by pushing straight down and twisting slightly in either direction (See **Figure 41**)



Figure 41

(NOTE: Be sure that the back-up ring is fully seated). Make sure you fully seat the plunger.

Plunger Pumps

Service Pumps (continued)

4. Install the small copper washer on top of the plunger and place a small quantity of thread sealant in the thread. Install the plunger nut and tighten to the required torque. (See Figure 42 & 43) (See parts breakdown)



Figure 42



Figure 43

Pump head to drive end Installation

1. Turn the crankshaft to align the plungers as shown. (See Figure 44)
2. Place the head evenly onto the plungers and push it until it makes contact with the drive end of the pump. (See Figure 45)
3. Torque the head bolt as shown in the tightening sequence diagram. (See Figure 46 & 47) (See parts breakdown).



Figure 44



Figure 45



Figure 47



Figure 46

Oil Change

Change oil after first 50 hours of use. Then every 500 hours. Refer to parts breakdown for oil type.

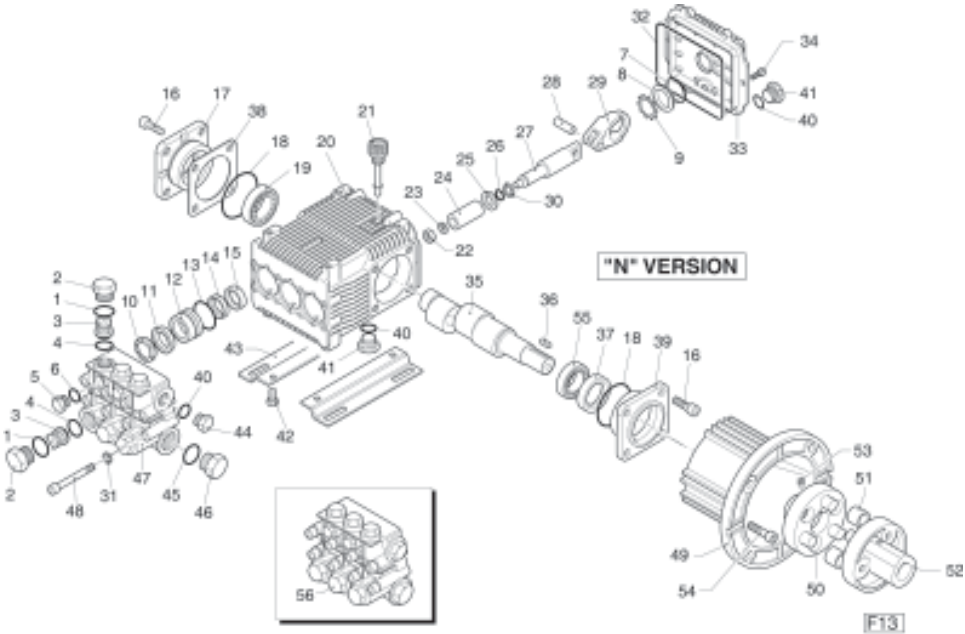
Troubleshooting

Symptom	Possible Cause(s)	Corrective Action
Oil Leak Between Crankcase and Pumping Section	Worn rod oil seals	Replace crankcase piston rod seals
Frequent or Premature Failure of the Packing	1. Cracked, damaged or worn plunger 2. Overpressure to inlet manifold 3. Material in the fluid being pumped 4. Excessive pressure and/or temperature of fluid being pumped 5. Running pump dry	1. Replace plungers 2. Reduce inlet pressure 3. Install proper filtration on pump inlet plumbing 4. Check pressures and fluid inlet temperature; be sure they are within specified range 5. Do not run pump without water
Pump Runs but Produces no Flow	Pump is not primed	Flood suction then restart pump
Pump Fails to Prime	Air is trapped inside pump	Disconnect discharge hose from pump. Flood suction hose, restart pump and run pump until all air has been evacuated
Pump Loses Prime, Chattering Noise, Pressure Fluctuates	1. Air leak in suction hose or inlet 2. Clogged suction strainer	1. Remove suction line and inspect it for a loose liner or debris lodged in hose. Avoid all unnecessary bends. Do not kink hose 2. Clean strainer
Low Pressure at Nozzle	1. Unloader valve is bypassing 2. Incorrect or worn nozzle 3. Worn packing or valves	1. Make sure unloader is adjusted properly and bypass seat is not leaking 2. Make sure nozzle is matched to the flow and pressure of the pump. If the nozzle is worn, replace 3. Replace packing or valves
Pressure Gauge Fluctuates	1. Valves worn or blocked by foreign bodies 2. Packing worn	1. Clean or replace valves 2. Replace packing
Low Pressure	1. Worn nozzle 2. Belt slippage 3. Air leak in inlet plumbing 4. Relief valve stuck, partially plugged or improperly adjusted valve seat worn	1. Replace with nozzle of proper size 2. Tighten or replace with correct belt 3. Disassemble, reseal and reassemble 4. Clean and adjust relief valve; check for worn or dirty valve seats

Troubleshooting

Symptom	Possible Cause(s)	Corrective Action
Low Pressure (cont)	5. Worn packing. Abrasive in pumped in cavitation. Inadequate water 6. Worn inlet, discharge valve blocked or dirty	5. Install proper filter. Suction at inlet manifold must be limited to lifting less than 20 feet of water or 8.5 psi vacuum 6. Replace inlet and discharge valve
Pump Runs Extremely Rough, Pressure Very Low	Inlet restrictions and/or air leaks. Stuck inlet or discharge valve	Clean out foreign material. Replace worn valves
Water Leakage from Under Manifold. Slight Leak	Worn packing or cracked plunger	Install new packing or plunger
Oil Leaking in the Area of Crankshaft	1. Worn crankshaft seal or improperly installed oil seal O-ring 2. Bad bearing	1. Remove oil seal retainer and replace damaged O-ring and/or seals 2. Replace bearing
Excessive Play in the End of the Crankshaft Pulley	Worn main bearing from excessive tension on drive belt	Replace crankcase bearing and/or tension drive belt
Water in Crankcase	1. Humid air condensing into water inside the crankcase 2. Worn packing and/or cracked plunger	1. Change oil intervals 2. Replace packing. Replace plunger
Loud Knocking Noise in Pump	1. Cavitation or sucking air 2. Pulley loose on crankshaft 3. Broken or worn bearing	1. Check water supply is turned on 2. Check key and tighten set screw 3. Replace bearing

RK 1450 RPM



Legend

Ø 18	Ø 18	Ø 20	Ø 22
For ○	For □	For ▼	For ◆
RK11.14	RK13.12	RK18.20H	RK21.20H
RK11.20H	RK13.20H		
For ●	For ■		
RK15.15	RK14.16		
RK15.20H			
RK15.28H			

Repair Kits

Water Seals	Valves	Pistons	Oil Seals
Kit 1857 Ø18 Kit 1887 Ø20 Kit 1888 Ø22	Kit 2864	Kit 2546 Ø18 Kit 2547 Ø20 Kit 2759 Ø22	Kit 1855
Pos.	Qty.	Pos.	Qty.
11	3	3	6
13	3	4	6
14	3		
		22	3
		23	3
		24	3
		25	3
		26	3
		57	3
		15	3
		18	2
		32	1
		37	1

Special Parts

Code	Description	Qty.
2809	Viton water seals Ø18	1
2810	Viton water seals Ø20	1
2811	Viton water seals Ø22	1
2819	Water seal in 180°F Ø18	1

Support Rings

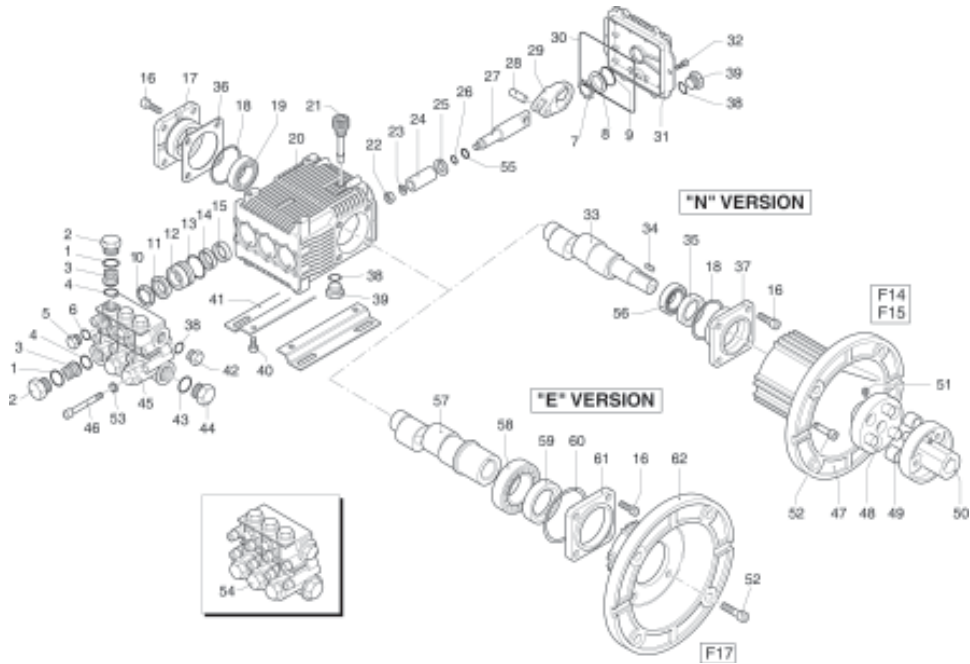
Kit 1829 Ø18	
Kit 1815 Ø20	
Kit 1816 Ø22	
Pos.	Qty.
10	3

Pos.	Code	Description	Qty.	Pos.	Code	Description	Qty.
1	960160	O-Ring	6	30	1080401	Back-up ring	3
2	960090	Brass valve cap (478 in/lbs)	6	31	1381850	Washer	8
	960850	SS valve cap (478 in/lbs)	6	32	1780510	O-Ring	1
	1380740	NP valve cap (478 in/lbs)	6	33	1789010	Complete cover	1
	960090T	Brass valve cap 1/4" threaded	1	34	1343510	Bolt (89 in/lbs)	6
	960850T	SS valve cap 1/4" threaded	1	35	2280100	Crankshaft	○ 1
3	1389051	Complete valve	6		2280080	Crankshaft	□ 1
4	880830	O-Ring	6		2280070	Crankshaft	◆ 1
5	880581	Brass plug 1/4G	2		2280060	Crankshaft	▽ ● 1
	1380690	NP plug 1/4G	2	36	1380520	Key	1
6	820510	O-Ring	2	37	180340	Oil seal	1
7	1260430	Snap ring	1		1380120	0.10mm shim	1-3
8	1260250	Oil sight glass	1		1380130	0.20mm shim	1-3
9	1140450	O-Ring	1		1380530	0.25mm shim	1-3
10	960110	Support ring	○ □ ● ◆ 3		1382810	0.05mm shim	1-3
	840300	Support ring	▽ 3	39	1380040	Open bearing sup. (217 in/lbs)	1
	840320	Support ring	◆ 3	40	740290	O-Ring	3
11	880320	High pressure packing	○ □ ● ◆ 3	41	1980740	3/8" G plug	2
	840290	High pressure packing	▽ 3	42	1260470	Bolt	4
	840330	High pressure packing	◆ 3	43	1380141	Mounting Rail	2
12	1380090	Piston guide	○ □ ● ◆ 3	43b	1837	1-1/4" Rail Kit	1
	1380150	Piston guide	▽ 3	43c	2633	5/8" Rail Kit	1
	1380160	Piston guide	◆ 3	43d	2633H	2-5/8" Rail Kit	1
13	961240	O-Ring	3	44	1980740	3/8" G plug	1
14	880330	Low pressure seal	○ □ ● ◆ 3		1981180	3/8" G plug (NP)	1
	840280	Low pressure seal	▽ 3	45	180101	O-Ring	1
	840340	Low pressure seal	◆ 3		820361	Plug 1/2G	1
15	1383130	Oil seal	3	46	960870	Plug 1/2G (NP)	1
16	850370	Bolt (217 in/lbs)	8	47	1381071	Pump head Ø18	1
17	1380050	Closed bearing sup.	1		1381070	Pump head Ø18 (NP)	1
18	640030	O-Ring	2		1380680	Pump head Ø20-Ø22	1
19	2280240	Bearing	1	48	820150	Screw (217 in/lbs)	8
20	1382770	Pump housing	1	49	1380380	El. Motor flange	1
21	880130	Oil cap	1	50	1380300	Pump coupling	1
22	962010	Nut (106 in/lbs)	3	51	1321670	Bushing	6
23	962000	Washer	3	52	1380330	Motor coupling 1-1/8 (F14)	1
24	1380940	Piston	○ □ ● ◆ 3		1380350	Motor coupling 1-3/8 (F15)	1
	1380930	Piston	▽ 3	53	1380180	Grub screw	1
	1382360	Piston	◆ 3	54	620610	Screw	4
25	1380950	Spacer	3	55	840370	Bearing	1
26	600180	O-Ring	3		1389270	Complete pump head Ø18	1
27	1380920	Guiding piston	3		1389272	Complete pump head Ø18 (NP)	1
28	1380060	Piston pin	3		1389271	Complete pump head Ø18 (NP)	1
29	1383050	Aluminum con-rod <3000 PSI	3		1389212	Complete pump head Ø20 (NP)	1
	1383020	Bronze con-rod >3000 PSI	3		1389220	Complete pump head Ø22 (NP)	1

Oil

AR64516 Specially formulated oil 16oz 1

RKA 1750 RPM



Legend

Ø 18 For ○ RKA3.5G25 RKA3.5G30H RKA3.5G40H	Ø 18 For □ RKA4G20 RKA4G30 RKA4G30H RKA4G36H RKA4G40H	Ø 20 For ▼ RKA5.5G13 RKA5.5G20H	Ø 22 For ◆ RKA6.5G20H
For ● RKA4.5G17 RKA4.5G25		For ■ RKA7G20H	

Repair Kits

Water Seals	Valves	Pistons	Oil Seals
Kit 1857 Ø18 Kit 1887 Ø20 Kit 1888 Ø22	Kit2864	Kit 2546 Ø18 Kit 2547 Ø20 Kit 2759 Ø22	Kit1855 NVersion Kit1856 EVersion
Pos. Qty.	Pos. Qty.	Pos. Qty.	Pos. Qty.
11 3	3 6	22 3	15 3
13 3	4 6	23 3	18 2
14 3		24 3	30 1
		25 3	35 NVersion1
		26 3	59 EVersion1
		53 3	60 EVersion1

Special Parts

Code	Description	Qty.
2809	Viton water seals Ø18	1
2810	Viton water seals Ø20	1
2811	Viton water seals Ø22	1
2819	Water seal in 180°F Ø18	1
2820	Water seal in 180°F Ø20	1

Support Rings

Kit 1829 Ø18 Kit 1815 Ø20 Kit 1816 Ø22
Pos. Qty.
10 3

Pos.	Code	Description	Qty.	Pos.	Code	Description	Qty.
1	960160	O-Ring	6	36	1380120	0.10mm shim	1-3
2	960090	Brass valve cap (478 in/lbs)	6		1380130	0.20mm shim	1-3
	960850	SS valve cap (478 in/lbs)	6		1380530	0.25mm shim	1-3
	1380740	NP valve cap (478 in/lbs)	6		1382810	0.05mm shim	1-3
	960090T	Brass valve cap 1/4" threaded	1	37	1380040	Open bearing sup. (217 in/lbs)	1
	960850T	SS valve cap 1/4" threaded	1	38	740290	O-Ring	3
3	1389051	Complete valve	6	39	1980740	3/8" G plug	2
4	880830	O-Ring	6	40	1260470	Bolt	4
5	880581	Brass plug 1/4G	2	41	1380141	Mounting rail	2
	1380690	NP plug 1/4G	2	41b	1837	1-1/4" Rail Kit	1
6	820510	O-Ring	2	41c	2633	5/8" Rail Kit	1
7	1260430	Snap ring	1	41d	2633H	2-5/8" Rail Kit	1
8	1260250	Oil sight glass	1	42	1980740	3/8" G plug	1
9	1140450	O-Ring	1		1981180	3/8" G plug (NP)	1
10	960110	Support ring ○□●	3	43	180101	O-Ring	1
	840300	Support ring ▼	3	44	820361	Plug 1/2G	1
	840320	Support ring ◆■	3		960870	Plug 1/2G (NP)	1
11	880320	High pressure packing ○□●	3	1381071	Pump head Ø18	1	
	840290	High pressure packing ▼	3	1381070	Pump head Ø18 (NP)	1	
	840330	High pressure packing ◆■	3	1380020	Pump head Ø20	1	
12	1380090	Piston guide ○□●	3	1380680	Pump head Ø20 (NP)	1	
	1380150	Piston guide ▼	3	1383010	Pump head Ø22	1	
	1380160	Piston guide ◆■	3	1383310	Pump head Ø22 (NP)	1	
13	961240	O-Ring	3	46	820150	Head Bolt (217 in/lbs)	8
14	880330	Low pressure seal ○□●	3	47	1380490	El. motor flange	1
	840280	Low pressure seal ▼	3	48	1380300	Pump coupling	1
	840340	Low pressure seal ◆■	3	49	1321670	Bushing	6
15	1383130	Oil seal	3	50	1380330	Motor coupling 1-1/8 (F14)	1
16	850370	Bolt (217 in/lbs)	8		1380350	Motor coupling 1-3/8 (F15)	1
17	1380050	Closed bearing sup.	1	51	1380180	Set screw	1
18	640030	O-Ring	2	52	620610	Bolt	4
19	2280240	Bearing	1	53	1381850	Washer	8
20	1382770	Pump housing	1		1389270	Complete pump head Ø18	1
21	880130	Oil cap	1		1389272	Complete pump head Ø18 (NP)	1
22	962010	Nut (106 in/lbs)	3		1389271	Complete pump head Ø18 (NP)	1
23	962000	Washer	3		1389212	Complete pump head Ø20 (NP)	1
24	1380940	Piston ○□●	3		1389289	Complete pump head Ø22 (NP)	1
	1380930	Piston ▼	3	55	1080401	Back-up ring	1
	1382360	Piston ◆■	3	56	840370	Bearing	1
25	1380950	Slinger	3		2280260	Hollow shaft Ø1 1/8" ○	1
26	600180	O-Ring	3		2280200	Hollow shaft Ø1 1/8" □	1
27	1380920	Guiding piston	3		2280270	Hollow shaft Ø1 1/8" ▼	1
28	1380060	Piston pin	3		2280280	Hollow shaft Ø1 1/8" ■	1
29	1383050	Aluminum con-rod <3000 PSI	3	58	1380320	Bearing	1
	1383020	Bronze con-rod >3000 PSI	3	59	621170	Oil seal	1
30	1780510	O-Ring	1	60	1380220	O-Ring	1
31	1789010	Complete cover	1	61	1380210	Shaft cover	1
32	1343510	Bolt (89 in/lbs)	6	62	1591	El. Motor Flange NEMA 184TC	1
33	2280100	Crankshaft ○	1				
	2280080	Crankshaft □	1				
	2280070	Crankshaft ▼◆●	1				
	2280060	Crankshaft ■	1				
34	1380520	Key	1				
35	180340	Oil seal	1				

AR64516

Oil

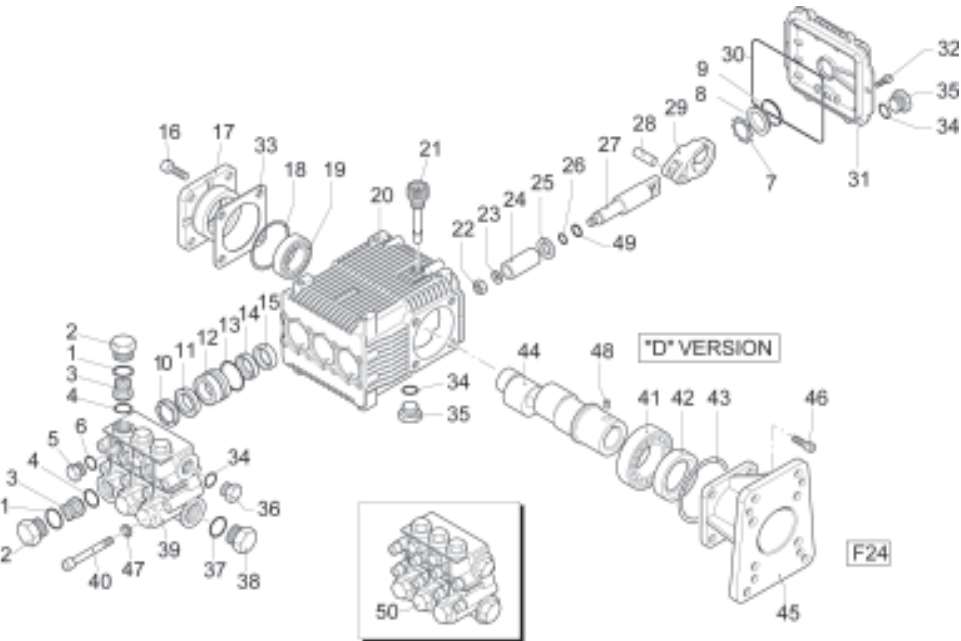
Specialy formulated oil 16oz

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Oil

AR64516 Specially formulated oil 16oz 1

RKV 3400 RPM



Legend

Ø 18 For ○ RKV3.5G30	Ø 18 For □ RKV4G30A	Ø 18 For ▼ RKV5G32 RKV4.5G40H	Ø 18 For ◆ RKV5.5G40H
	For ■ RKV4G32	For ▲ RKV3.5G35H RKV3.5G40H	For ★ RKV4G35H RKV4G36 RKV4G40H

Repair Kits

Water Seals	Valves	Pistons	Oil Seals
Kit 1857	Kit1828	Kit 2546	Kit 1856
Pos. Qty.	Pos. Qty.	Pos. Qty.	Pos. Qty.
11 3	3 6	22 3	15 3
13 3	4 6	23 3	18 2
14 3		24 3	30 1
		25 3	42 1
		26 3	43 1
		49 3	

Special Parts

Code	Description	Qty.
2809	Viton water seals Ø18	1
2819	Water seal in 180°F Ø18	1

Support Rings

Kit 1829

Pos. Qty.

10 3

Pos.	Code	Description	Qty.	Pos.	Code	Description	Qty.
1	960160	O-Ring	6	36	1980740	3/8" G plug Brass	1
2	960090	Valve cap Brass (478 in/lbs)	6	37	1981180	3/8" G plug NP	1
3	960850	Valve cap SS (478 in/lbs)	6	38	180101	O-Ring	1
4	960090T	Brass valve cap 1/4" threaded	1	39	820361	Plug 1/4G Brass	1
5	960850T	SS valve cap 1/4" threaded	1	40	960870	Plug 1/4G NP	1
6	889052	Complete valve	6	41	1381071	Pump head	1
7	1389051	Complete valve	6	42	1381070	Pump head	1
8	880830	O-Ring	6	43	820150	Head bolt (217 in/lbs)	8
9	880581	Plug 1/4G Brass	2	44	1380320	Bearing	1
10	1380690	Plug 1/4G NP	2	45	621170	Oil seal	1
11	820510	O-Ring	2	46	1380220	O-Ring	1
12	1260430	Snap ring	1	47	2280140	Hollow shaft 1"	1
13	1260250	Oil sight glass	1	48	2280130	Hollow shaft 1"	1
14	1140450	O-Ring	1	49	2280590	Hollow shaft 1"	1
15	960110	Support ring	3	50	2280600	Hollow shaft 1"	1
16	880320	High pressure packing	3	51	1597	Gas engine flange	1
17	1380090	Piston guide	3	52	180030	Bolt	4
18	961240	O-Ring	3	53	1381850	Washer	8
19	880330	Gasket	3	54	820440	Set screw	1
20	1383130	Oil seal	3	55	1080401	Back-up ring	3
21	850370	Bolt (217 in/lbs)	8	56	1389232	Complete pump head	1
22	1380050	Closed bearing sup.	1	57	1389228	Complete pump head	1
23	640030	O-Ring	2	58	1389224	Complete pump head	1
24	2280240	Bearing	1				
25	1382770	Pump housing	1				
26	880130	Oil cap	1				
27	962010	Nut (106 in/lbs)	3				
28	962000	Washer	3				
29	1380940	Piston	3				
30	1380950	Slinger	3				
31	600180	O-Ring	3				
32	1380920	Guiding piston	3				
33	1380060	Piston pin	3				
34	1383050	Aluminum con-rod	3				
35	1383020	Bronze con-rod	3				
	1780510	O-Ring	1				
	1789010	Complete cover	1				
	1343510	Bolt (89 in/lbs)	6				
	1380120	0.10mm shim	1-3				
	1380130	0.20mm shim	1-3				
	1380530	0.25mm shim	1-3				
	1382810	0.05mm shim	1-3				
	740290	O-Ring	3				
	1980740	3/8" G plug	2				

Oil

AR64516 Specially formulated oil 16oz 1

Plunger Pumps

Torque Specifications in/lbs:(ft/lbs)

Oil Capacity	Manifold (Head)	Piston Nut	Rear Cover	Side Cover	Valve Cap	Connecting Rods
15.5	217/(18)	106/(8.8)	89/(7.5)	217/(18)	478/(40)	N/A

LIMITED WARRANTY

Annovi Reverberi (A.R.) *Cam Shaft Plunger Pumps* are warranted for a period of five years and *Axial Radial Pumps* are warranted for a period of one year to the original purchaser. *Electric Pressure Washers* are warranted for a period of one year to the original purchaser. This is from the date shipped from factory or U.S. Warehouse. **AR, ArrowLine** and **GF** accessories are warranted for a period of 90 days.

Warranty covers manufacturing defects or workmanship that may develop under normal use and service in a manner up to the directions and usage recommended by the manufacturer.

Warranty does not apply to misuse or when pump or accessory is altered or used in excess of recommended speeds, pressures, temperatures or handling fluids not suitable for pump or accessory material construction. Warranty does not apply to normal wear, freight damage, freezing damage or damage caused by parts or accessories not supplied by AR North America, Inc.

Liability of manufacturer for warranty is limited to repair or replacement at the option of the manufacturer when such products are found to be of original defect or workmanship at the time it was shipped from factory. This warranty is in lieu of all other warranties, expressed or implied, including any warranty of merchantability and of any and all other obligations or liabilities on the part of the manufacturers or equipment.

WARRANTY RETURNS

Items returned for warranty consideration must have a **Returned Merchandise Authorization (RMA)** number. All unauthorized returns will be refused and shipped back to sender. Please fax requests to: 651-636-1424 or e-mail to shop@arnorthamerica.com.

